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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/561,253	12/19/2005	James M. Tour	11321-P068WOUS	6532

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Robert C Shaddox
Winstead Sechrest Minick
PO Box 50784
Dallas, TX 75201

EXAMINER	
CHEUNG, WILLIAM K	

ART UNIT	PAPER NUMBER
1796	

MAIL DATE	DELIVERY MODE
11/03/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/561,253	TOUR ET AL.	
	Examiner	Art Unit	
	WILLIAM K. CHEUNG	1796	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 September 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-6,8-28 and 31-34* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6,8-28 and 31-34* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Request for Continued Examination

1. The request filed on September 17, 2009 for a Request for Continued Examination (RCE) under 37 CFR 1.53(d) based on parent Application No. 10/561,253 is acceptable and a RCE has been established. An action on the RCE follows.

2. In view of the amendment filed September 17, 2009, claims 7, 29, 30 have been cancelled. Claims 1-6, 8-28, 31-34 are pending.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. Claims 1-6, 8-28, 31-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tour et al. (WO 02/060812) in view of Lamb et al. (US 3,554,992) for the reasons adequately set forth from paragraph 4 of the office action of June 17, 2009.

1. (Currently Amended) A method comprising:

a) providing functionalized carbon nanotubes,

wherein the functionalized carbon nanotubes are selected from the group consisting of:

(i) aryl halide functionalized carbon nanotubes, ~~and~~

wherein the aryl halide comprises a halide selected from the group consisting of chlorine, bromine, iodine, and combinations thereof, and

(ii) carbon nanotubes comprising nucleation sites operable for initiating a polymerization reaction after deprotonation of said nucleation sites to form initiator groups,

wherein the polymerization reaction is selected from the group consisting of anionic polymerization and ring opening polymerization;

b) dispersing the functionalized carbon nanotubes in a solvent;

c) adding to the solvent at least one reagent selected from the group consisting of:

(i) an alkyllithium species,

(ii) a metal, and

(iii) a deprotonating agent,

wherein the at least one reagent reacts with the functionalized carbon nanotubes to form a polymerizable species on the carbon nanotubes;

wherein the polymerizable species is selected from the group consisting of an aryl-lithium species comprising aryl-lithium bonds, an aryl-metal species comprising aryl-metal bonds, and initiator groups;

wherein deprotonation of the nucleation sites forms the initiator groups;

d) adding a monomer to the solvent; and

e) initiating a polymerization reaction between the monomer and the polymerizable species on the carbon nanotubes to form a polymer-carbon nanotube material,

wherein a polymer comprising the polymer-carbon nanotube material is covalently bound to the carbon nanotubes; and

wherein the polymerization reaction is selected from the group consisting of anionic polymerization and ring opening polymerization.

2. (Currently Amended) A method comprising:

a) providing aryl halide functionalized carbon nanotubes;

wherein the aryl halide comprises a halide selected from the group consisting of chlorine, bromine, iodine, and combinations thereof;

b) dispersing the aryl halide functionalized carbon nanotubes in a solvent;

c) adding an alkyllithium species to the solvent,

wherein the alkyllithium species reacts with the aryl halide functionalized carbon nanotubes to form an aryl-lithium species;

wherein the aryl-lithium species comprises a polymerizable species on the carbon nanotubes; and

wherein the polymerizable species comprises~~ing~~ aryl-lithium covalent bonds;

d) adding a monomer to the solvent; and

e) initiating a polymerization reaction between the monomer and the polymerizable ~~aryl-lithium~~ species to form a polymer-carbon nanotube material,

wherein a polymer comprising the polymer-carbon nanotube material is covalently bound to the carbon nanotubes; and

wherein the polymerization reaction is selected from the group consisting of anionic polymerization and ring opening polymerization.

3. (Currently Amended) A method comprising:

a) providing aryl halide functionalized carbon nanotubes;

wherein the aryl halide comprises a halide selected from the group consisting of chlorine, bromine, iodine, and combinations thereof;

b) dispersing the aryl halide functionalized carbon nanotubes in a solvent;

c) adding a metal to the solvent,

wherein the metal reacts with the aryl halide functionalized carbon nanotubes to form an aryl-metal species;

wherein the aryl-metal species comprises a polymerizable species on the carbon nanotubes; and

wherein the polymerizable species comprises~~ing~~ aryl-metal covalent bonds;

d) adding a monomer to the solvent; and

e) initiating a polymerization reaction between the monomer and the polymerizable ~~aryl metal~~ species to form a polymer-carbon nanotube material,

wherein a polymer comprising the polymer-carbon nanotube material is covalently bound to the carbon nanotubes; and

wherein the polymerization reaction is selected from the group consisting of anionic polymerization and ring opening polymerization.

10. (Currently Amended) A method comprising:

a) providing functionalized carbon nanotubes,

wherein the functionalized carbon nanotubes comprise nucleation sites operable for initiating a polymerization reaction after deprotonation of said nucleation sites to form initiator groups;

wherein the polymerization reaction is selected from the group consisting of anionic polymerization and ring opening polymerization;

b) dispersing the functionalized carbon nanotubes in a solvent;

c) adding a deprotonating agent to the solvent,

wherein the deprotonating agent deprotonates the nucleation sites to form initiator groups operable for initiating the polymerization reaction;

d) adding a monomer to the solvent; and

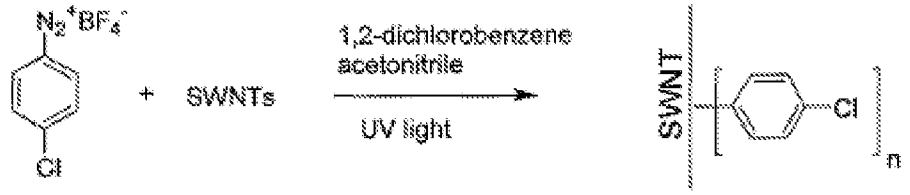
e) initiating a polymerization reaction between the monomer and the initiator groups to form a polymer-carbon nanotube material,

wherein a polymer comprising the polymer-carbon nanotube material is covalently bound to the carbon nanotubes; and

wherein the polymerization reaction is selected from the group consisting of anionic polymerization and ring opening polymerization.

Tour et al. (page 8/12 of figures, Figure 15) disclose the preparation of single-wall carbon nano-tube (SWNT) functionalized with aryl chlorine containing functionality.

Figure 15



Then, Tour et al. (page 2, line 13-18) disclose halogenated SWNT can participate reactions with alkyl-lithium reagent (via Grignard reaction mechanism). Further, Tour et

al. (page 31, claims 125-129) disclose that the functionalize SWNT can undergo various polymerization mechanisms that includes anionic polymerization.

Regarding claim 10 which recites "operable for anionic or ring opening polymerization", in view of the substantially identical SWNT disclosed in Tour et al. and as claimed, the examiner has a reasonable basis that the "operable" feature is inherently possessed in Tour et al.

Regarding claim 33 which recites "the step of utilizing the polymer-carbon nanotube material in a drug delivery process" or regarding claim 34 which recites "the step of utilizing the polymer-carbon nanotube material for scaffolding to promote cellular tissue", the recitations are merely related to the intended use of the claimed process, applicants must recognize that a recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim.

The difference between Tour et al. and the invention as claimed is that Tour et al. do not teach the specific mechanism for preparing a polymer.

However, Lamb et al. (col. 3, line 14 to col. 4, line 75) clearly disclose the specifics for using a Grignard reaction for initiating a polymerization process. Lamb et al. (col. 3, line 41-53) disclose the types of monomers that are suitable for the polymerization process as claimed. Lamb et al. (col. 3, line 54-67) disclose the use of ethereal solvents and hydrocarbon solvents for the polymerization process. Although Lamb et al. do not specifically indicate the use of THF as one of the ethereal solvent,

however, it would not be difficult to one of ordinary skill in art recognize and appreciate that THF is also an ethereal solvent. (see http://en.wikipedia.org/wiki/Grignard_reaction)

Regarding the claimed “terminating agents" of claims 25, 26, Lamb et al. (col. 4, line 44) clearly disclose the use of methanol for precipitating the polymers from the solution, the examiner has a reasonable basis that one of ordinary skill in art would have recognize that the disclosed “method” is a terminating agent, and that other organic alcohols, such as ethanol would also be a functional equivalence of the disclosed methanol terminating agent. (see http://en.wikipedia.org/wiki/Grignard_reaction)

Regarding the concentration feature of claim 27, and the temperature feature of claim 28, the mere variation of concentration and temperature are considered obvious because it is within the skill of one of ordinary skill in art to apply "routine optimization" process to optimize that concentration and temperature conditions of a polymerization process, motivated by the expectation of increasing the yield or the improving the quality of the polymer products.

Motivated by the expectation of success of preparing a polymer with a Grignard reagent, it would have been obvious to one of ordinary skill in art to incorporate all reaction related specifics as taught in Lamb et al. into Tour et al. to obtain the invention as claimed.

Regarding the “deprotonating agent” of claims 14-15, the variation of concentration of claim 27, and the polymerization temperature of claim 28, Tour et al. (page 2, line 13-18) clearly disclose that halogenated SWNT can participate reactions

with alkyl-lithium reagent (via Grignard reaction mechanism). Further, Tour et al. (page 31, claims 125-129) disclose that the functionalize SWNT can undergo various polymerization mechanisms that includes anionic polymerization. The minor variation of the reaction conditions of an explicitly taught polymerization route is considered obvious. Motivated by the expectation of success of developing a polymerization process using halogenated SWNT, it would have been obvious to one of ordinary skill in art to consult general information on Grignard reaction to obtain the polymerization conditions as claimed in claims 27, 28. (see http://en.wikipedia.org/wiki/Grignard_reaction)

Applicant's arguments filed September 17, 2009 have been fully considered but they are not persuasive.

Applicants argue that the invention as claimed is different from the invention disclosed in Tour et al. by indicating that the claimed invention involves the reaction mechanism of Figure 1 (argument filed September 17, 2009) versus the mechanism disclosed in Tour et al. (Figure 2).

Figure 1

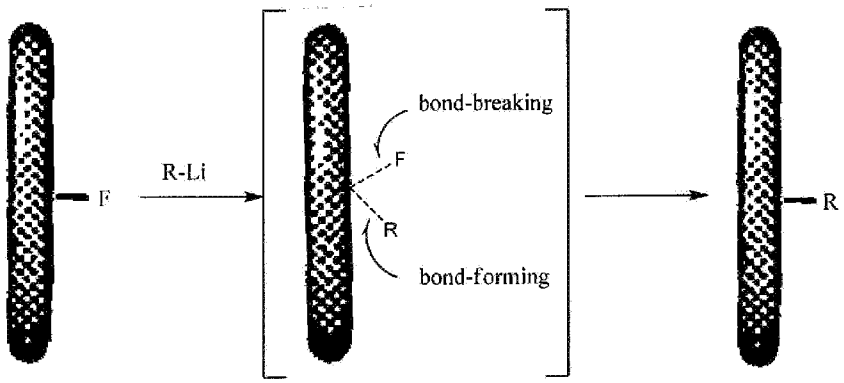
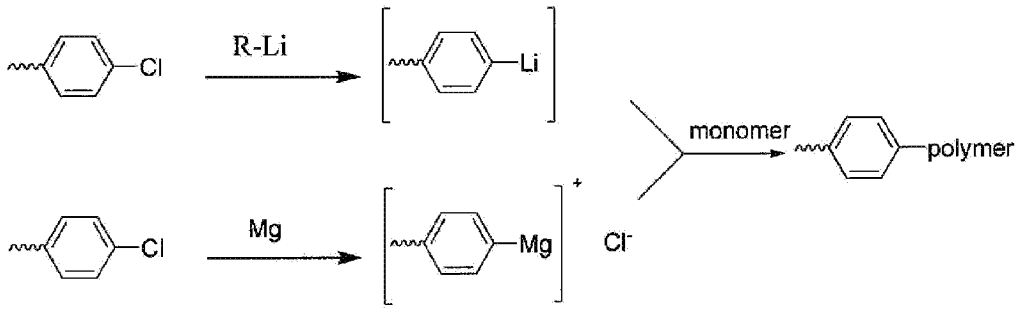


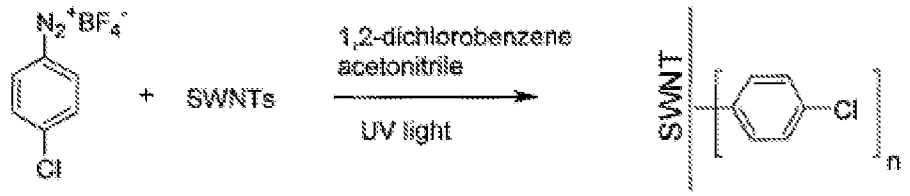
Figure 2



However, applicants fail to recognize that the argued difference in mechanism (SN2 versus nucleophilic substitution) is not supported by the claims as written. Further, the mechanism as depicted in Figure 1 does not lead to the formation of aryl halide functionalized carbon nanotubes as required by the claims as written.

Regarding applicants' argument that there is no expectation for the Grignard complex teachings of Lamb et al. to be reactive with the functionalized carbon nanotubes of Tour et al., applicants fail to recognize that Tour et al. (page 8/12 of figures, Figure 15) clearly disclose the preparation of single-wall carbon nano-tube (SWNT) functionalized with aryl chlorine containing functionality. Then, Tour et al. (page 2, line 13-18) clearly disclose halogenated SWNT can participate reactions with alkyl-lithium reagent (via Grignard reaction mechanism).

Figure 15



Regarding applicants' argued difference between a Grignard complex versus Grignard reagent, applicants must recognize that Grignard complexes are made with Grignard reagent. Applicants must recognize must also recognize that Grigard "reagent" is "a reagent" for making Grignard complexes.

In view of the reasons set forth above, the rejection is maintained.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to WILLIAM K. CHEUNG whose telephone number is

(571)272-1097. The examiner can normally be reached on Monday-Friday 9:00AM to 2:00PM; 4:00PM to 8:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David WU can be reached on (571) 272-1114. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/William K Cheung/
Primary Examiner, Art Unit 1796

William K. Cheung, Ph. D.
Primary Examiner
October 27, 2009